ART AND SCIENCE AS APPLIED TO THE PRACTICE OF MEDICINE.

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No sooner had I accepted the flattering invitation to deliver the address upon this the opening of the new college year, than I realized how large a mountain loomed up before me in the selection of a profitable and interesting theme. Before so general an audience as this a technical discourse would be quite out of place. In consonance with the occasion it seemed to me that I might speak of the *art* and the *science* of medicine, especially the principles underlying the broad conception of art and science, as applied to the *practice* of healing, and yet not be wholly unentertaining.

One thing I very promptly concluded not to do, namely, to retail the history of medicine "from Hippocrates down," as is so often and wearisomely done upon these occasions. The task would doubtless have been an easy and time saving one, with the assistance of a good encyclopædia and a rapid stenographer. I have listened to such addresses and have usually all but gone to sleep. As Bacon intimates, it was their easy writing that made the listening to them hard.

Another trite theme which arose in my mind and about which we are compelled to hear much to-day, is the wonderful progress of modern medicine. Tempting as such a theme is, I quickly discovered

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good and valid reasons for passing it by. The recent advances of medicine are being iterated and reiterated upon every possible relevant and irrelevant occasion. Vaccination, bacteria, serum therapy, anæsthesia, and surgical technique have become, as subjects of medical discourse, as platitudinous as the state of the weather or the condition of the crops. In most instances the announcement of the title, modern advances of medicine, foretells for the audience a very humdrum address and a very poor speaker to deliver it. To present so self laudatory a subject, with all its technicalities, attractively demands on the part of the orator a tactful delicacy, a brilliancy of style, and a versatility of ideas. Few medical speakers, however, can lay claim to such distinction. The advances of medicine, as a matter of fact, are no greater than are the advances all along the line of science. This is the age of investigation and deep research, and medicine is merely keeping well in the van of progress. Most of my hearers will know in a few weeks more about these advances than I could begin to relate in the few moments at my disposal.

The goodness, charity, and selfsacrifice of the medical profession is another frequent theme that, in my judgment, is always ill timed and impertinent when handled before a lay audience. To pat one's self on the back and to sound the bugle of one's own praise is, to say the least, indelicate and a bit humorous. It is childish and tends to make the medical profession a laughing stock in the eyes of the rest of the world. I have never been convinced that physicians, as a class, are more charitable or kindly disposed to their fellow creatures than is any other class of worthy and reputable citizens. The latter, to be sure, have not the advantage that the physicians have in exhibiting *personally* their beneficence and good works; but with what means they do possess, money and sympathy, I think they

do quite as much charitable work as the physicians do. Much of the so called charity in our profession, be it said to our shame, is for personal advertisement and self aggrandizement. We must guard here against adding hypocrisy to the unpleasant charge of thinking too well of ourselves. It is pointed out that medical men give their services freely to the hospitals and dispensaries. True, they do give their services without salary or direct monetary return; but can it be candidly said that they give those services as a self sacrifice, without any hope of ultimate benefit? I think not; and I am entitled to think so, because there is abundant available proof that they do not. Let us be frank and have the courage of our convictions, declaring that in, as well as out of, the profession the laborer is worthy of his hire. Ability, competition, supply, and demand rule here as eleswhere; and as to charity and philanthropy, be it said, the medical profession ranks second to no other. It does what it can, in the best way that it can, to alleviate the sorrows and sufferings of the world. The spirit of charity is something that belongs to the man whether he be a medical man or not. It is not an exclusive endowment, nor is its exercise a special privilege, conferred upon him by a medical diploma. Therefore I will have nothing to say upon the philanthropic spirit of medicine. I prefer, if such a spirit really exists to any superior degree in my profession, to let my neighbor, the nonmedical man, speak of that.

And finally I know how pleased you will be when I tell you that I do not purpose preaching a sermon to the students in this audience. There is nothing so cheap and uncalled for, it seems to me, as the average talk upon morality and good behavior often doled out at the opening of the medical schools. A medical man is rarely a good preacher by heredity, training, or past mode of life; and for him to drop

into the giving of monotonous, singsong platitudes to a body of men who have reached years of discretion and who are about as experienced in life as he himself is, bespeaks either laziness, mental vacuity, or on coming old age. Medical students are as alert, attentive, and eager for knowledge as any body of men I know of. I am satisfied that a lecturer who finds it necessary in his class room to be incessantly admonishing his hearers, is himself the source of the trouble, his manner of presenting his subject being, in all probability, stale, stupid, and lacking in originality. *Science is never uninteresting.* It needs no help from sermons, admonitions, and moral discourses to make it attractive. It is the labored, flat, inartistic, inconsequential way in which science is often doled out that makes it seem repulsive. The dry rehearsal of mere facts and phenomena is neither brilliant nor illuminating. It is more often not even scientific, though such is what it usually is supposed to be in the class room. Explanation, correlation, and illustration are always fascinating, and when properly presented in conjunction with the description of facts and phenomena will constitute the attractive element in the scientific lecture. Of this I will have more to say anon.

The terms *medical art* and *medical science* are ever upon our lips. They stand for two separate and distinct ideas. It is my desire to emphasize the distinction so as to discover, if possible, how near to and how remote from we stand to-day, in actual medical practice, the fundamental conceptions of art and of science.

The *Century Dictionary* declares that an *art* is "the combination or modification of things to adapt them to a given end; the employment of given means to effect a purpose." Obviously, then, the term involves the idea of skill and dexterity.

From the same authority we learn that *science* is "knowledge; comprehension, or understanding of

facts or principles; knowledge gained by systematic observation, experiment, and reasoning; knowledge coordinated, arranged, and systematized." Note that this definition does not say anything about facts and phenomena when merely described as being scientific. It affirms that the comprehension and understanding of the facts and underlying principles constitute science.

The ultimate aim of both art and science is the realization of truth.

Wherein they differ is the manner of arriving at the truth. Science accomplishes it by means of analysis and criticism; art by means of synthesis and reconstruction. As Karslake has well said, "Science and art may be said to be investigations of truth, but science inquires for the sake of knowledge, art for the sake of production."

There is a partial overlapping, of course, of both art and science, just as there is in all the complex forms of human activity. There is some art or skill required in the analyses and criticisms of science, and there is much science lurking behind all forms of art expression. The truth aimed at in the art and science of medicine is health. The art endeavors to reveal that truth in all its physiological beauty and perfection by employing the most effective means for the restoration and maintenance of health. The science searches for that truth by uncovering the hidden laws and principles upon which health is founded. Not wrong are we, therefore, when we speak of the art of medicine as distinguished from the science. We are wrong only when we fail to give due recognition to both the art and the science, and like the quacks practise the art without the science, or, like certain narrow minded laboratory men, emphasize the science to the belittling of the value of the art.

Let me ask, for a few moments, your consideration of certain characteristics which belong to the practice of an art; and then I will request you to

apply those characteristics to the practice of medicine as we see it about us to-day. In doing the latter you will remark many things that may prove suggestive and profitable to yourselves.

Art, being synthetic and constructive, the dominant element in the cultivation of it must necessarily be the personality of the artist. In direct ratio with the natural endowments of a given individual will his artistic efforts be. The ability may rise to the level of talent, even to that of genius. It is something that cannot be acquired, though by cleverness it may be somewhat remotely and unevenly simulated. It depends upon some mysterious and inherent mode of brain action, about which we as yet know absolutely nothing. It is a unique, special, and congenital faculty. It is always the cause of much envy, but it cannot ever be directly acquired any more than can a desired increase of height. Moreover, it is seldom, if ever, understood by those who have it not. An old lady once said to Turner, after gazing at one of his most gorgeous paintings in the British Museum: "Mr. Turner, why do you use such brilliant coloring in your pictures? I never see such reds and blues and greens as that in nature." "Don't you wish you did, madam?" was all the reply he vouchsafed her. Of the things that the artistic mind is capable, most of us can only wish that ours were capable of them too. In medicine a man sometimes legitimately wins a large practice, obtains a surprising series of cures, or makes a most happy run of correct diagnoses. How he does it we cannot tell. Like the artist, he cannot always tell himself, for of all men the genuine artist is the poorest of critics and the least helpful of advisers. His mental mechanism seems to work instinctively, not through the slow processes of logic and rational deduction. When Sir Joshua Reynolds declared he mixed his colors with brains, he meant the brains of Reynolds and not the brains of anybody else. No mere knowledge of

rules will furnish one with an artist's mind. Nobody, perhaps, knew the secrets of the art of painting better than did Ruskin and Hamerton; yet the pictures of these two great critics were mere daubs beside those of Turner and Millet. A nobleman once asked Guido who was the model he sketched his beautiful Madonnas from. The painter, placing his color mixer, a huge, ugly, and ungainly man, in an appropriate pose, said to his visitor, "Count, that is my model," while at the same time he went on drawing the outlines of a most exquisite female figure.

So instinctive are the workings of the mind of the true artist, and so unknown are the laws of its mechanism, that the possessor of it at times seems to be a veritable law unto himself. Beethoven was once sharply criticised for breaking an established rule of harmony. In a burst of anger he exclaimed: "Rules! rules! who makes the rules of harmony? I make my own rules!" Thereafter the composer's alleged blunder became an accepted musical form. Little minds, and those not of the true artistic type, often ape this apparent lawlessness of genius, just as the gilded youth once imitated the collars of Lord Byron. An imitation, however, is always detectable, because it is always more or less lawless and inappropriate. Beethoven did not make his own rules of harmony, as he angrily exclaimed; but, by following instinctively his own transcendant genius, he merely revealed the principles of musical beauty which up to that time had not been portrayed by any one.

The dominance of the personality in the concept art precludes all possibility of simple imitation being in any sense true art. Photography is not an art any more than is the working of a turning lathe. The models from which both the camera and the turning lathe began making their copies may, in some way, have revealed the personality of the artist; but then it was the selection and the arrangement of the mod-

els, not the making of reproductions, that constituted the art. As Emerson puts it, speaking of trade and every mechanical craft, "there is in each of these works an act of invention, an intellectual step, or short series of steps, taken; that act or step is the spiritual act; all the rest is mere repetition of the same a thousand times." Imitators are never true artists. As soon, however, as they inject the slightest degree of their own personality into their work, that work at once becomes artistic in the broadest sense. Art, therefore, modifies, instead of imitating, everything that it touches. The modification indicates something that belongs *sui generis* to the artist. "Art has the advantage of nature," says Lubbock, "in so far as it introduces a human element, which is in some respects superior even to nature." A Webster dictionary can never be regarded as a work of art; a Scott novel can never be regarded as anything else. A Beethoven adagio is beyond all imitation, whereas a Richter exercise in counterpoint may be duplicated innumerable times. Wonderful copyists are the Chinese, but their art is of a very low grade. The accuracy and finish of Boileau's *L'art poétique* does not make it a work of art; the personality of the poet is utterly wanting in it. Mere imitation and accuracy can never alone result in the practice of the art of medicine. They will reach only as far as externalities and nonessentials. They are the cause of much of the quackery both in and out of the profession.

In this age there is much multiplication of everything, books, railroads, machinery, tall buildings, shirts, and cigars; but in the midst of it all there is comparatively very little genuine art. Lubbock says that "in art two and two do not make four, and no number of little things will make a great one." A physician's practice may be large and yet be as devoid of the art of medicine as a fourteen story skyscraper is of the art of architecture. Diagnosis and

therapeutics, however elaborately practised, do not alone constitute the art of medicine. The management of a single case, revealing a unique degree of appropriate intelligence, stands more for the practical art of medicine than do a hundred cases merely observed and haphazardly prescribed for. A large clientèle, like a multitude of bales of cotton, may be very profitable, and in a commercial sense may be very beautiful to behold. In no way, however, does it indicate real professional superiority. On the contrary, it is more likely to bespeak inferiority; for increase of quantity is usually synonymous with diminution of elegance and completeness. In the art of medicine "two and two do not make four and no number of little things will make a great one.

Once a nobleman asked Bismarck to place his son in some high office, urging that the boy was highly educated and well fitted for the position, since he could converse in a dozen different languages. The great chancellor knitted his brow and, after reflecting a few moments, replied to the anxious father that, in his opinion, his son would make a splendid headwaiter in a cosmopolitan hotel.

Dominant as is the personality of the artist in all of his work, that personality is further distinguished by being uniquely initiative, creative, enthusiastic, and positive, rather than conservative, destructive, calculating and negative. The artistic temperament is ever driving its possessor into doing something, however great or small that something may be. It leaves him little time or inclination to merely criticise and analyze what already exists. This creative faculty is far from being a common one. It provokes astonishment in those who, having it not, behold its strange and unwonted revelations. For this reason it generally confers upon its owner the leadership among his fellows. Its very wonder working keeps alive interest and enthusiasm. It is always positive, believing that affirmation and construction,

however slight, are nobler than mere denial and annihilation. It holds that Shelley's Ode to the Skylark is a greater work than are a thousand tomes of descriptive ornithology. It insists that the Greek Slave of Powers transcends a whole museum of human anatomy. It points out that the six hundred and twenty books of Varro, the most learned of Romans, are lost, while mere fragments of the poems of Sappho are still treasured beyond all price. Man himself being the most wonderful of creations, it is the exclusion of his personality from science that gives the supremacy to art. And therefore Thoreau exclaims: "My friends mistake when they communicate facts to me with so much pains. Their presence, even their exaggerations and loose statements, are equally good facts for me."

Novelty constitutes a prominent element of art; hence art is always hard to criticise. Very rightly do we say of a work of art that it is good or bad according to one's taste. Being a creation, it is wholly new and portrays for the first time the artist's taste, which may or may not correspond with ours. Hottentot music is not art to us; and much less would our music, I fancy, be art to the African savage. Works of art are always unique and distinctive.

Art is always most happily cultivated in an artistic environment. That is the reason why artists live, singly or in little groups, so much apart from the world. In the light of the importance of environment, it is not difficult to understand why Greece and Italy are the home of art, while Guiana and Kamschatka are not. The family life of the Bachs was enough in itself almost to turn out a remarkable group of musicians. The keeping together of the Lake poets gave a distinctive touch to their works. The Preraphaelites showed plainly their close intimacy with one another. The Elizabethan age of literature and the New England coterie of

authors owed not a little of their distinction and individuality to the times and local associations. A physician who yearns to excel in the art of medicine dare not live apart and away from the influences that tend toward the best and highest in his calling. The doctor must dwell in his books, his medical societies, his intellectual companionships. He must absorb the best they have to afford him, yield placidly to their highest influences, and feed his mind upon them every day. But alas! how often the rich literature of medicine is neglected for cards and club gossip! What arenas for petty squabbles and cheap politics are some of our medical societies! What miserable little jealousies are allowed to separate men who, as professed practitioners of a noble art, could be so helpful and inspiring to one another! Such conditions always betray a lamentable want of the proper temperament and environment. It indicates a raw commercial atmosphere; a dull, primitive level of barter and sale; not perhaps necessarily wrong in itself, but oh! so wearisomely monotonous, cheap, and commonplace. Babies and animals know very little beyond the desire and struggle for nutriment, and in the exercise of their incessant cunning to obtain it they are less despicable than certain adults who work the medical societies, journals and hospitals solely as a means of advertisement, whereby they may earn an extra pot of pottage. Such individuals wither and blight the art of medicine.

Another important fact to be noted in regard to the practice of an art is the laboriousness of it. Because the artistic temperament is a natural faculty the world has usually fancied that its exercise required no special effort. No greater mistake was ever made. Indeed genius, which is generally deemed the exemplar of the highest art, is sometimes defined as merely the capacity for taking infinite pains. I have heard it stated, upon good

authority, that Paderewski repeated uninterruptedly a certain cadenza, during one of his practising periods, some seven hundred and odd times. "Art is no recreation," says Ruskin; "it cannot be learned at spare moments nor pursued when we have nothing better to do." As Bryant sang:

"Deem not the framing of an immortal lay
The idle pastime of a summer's day."

Yet many students and practitioners play at this most difficult and exacting art of medicine.

Ruskin further tells us to "remember always that there are two characters in which all greatness of art consists—first, the earnest and intense seizing of natural facts; then the ordering those facts by the strength of human intellect so as to make them, for all who look upon them, to the utmost serviceable, memorable, and beautiful." There are laws and principles—great truths, if you please—that underlie all art. Painting without a knowledge of color, drawing, and perspective is Chinese art. Music devoid of harmony and rhythm is not even, as Johnson defined music, "the least objectionable form of noise."

And now this brings me to the second part of my discourse, the *science of medicine.* As I have just intimated, the art of medicine is a farce unless it is guided by certain truths and based upon certain established principles. These, however, constitute the science of medicine.

No term is more misused at the present time than this term science. Practically nowadays every sort of silly routine, every systematic form of human activity, is denominated a science. There is the science of pedestrianism and pugilism. Cookery and haberdashery are said to be sciences. There is a Christian science, and a scientific Christianity. Everything, everything, from the mowing of the lawn to the sleeping in one's bed at night is taught scientifically these days *ad nauseam ad infinitum.* Se-

riously, however, science is knowledge, and stands only for the correlation of phenomena whereby causative factors and underlying laws are discovered. The mere application of principles for the accomplishment of certain ends is no more science, in the true sense of the word, than are the mere observation and description of unexplained isolated phenomena. What is there scientific in eating peanuts for sixty days to prove that life in a certain individual can be sustained on such a diet? Such a performance and many like it repeated in our laboratories is about as scientific as the eating of a green apple by little Willie to prove that a painless existence is, after all, the happiest. Much of what is dignified as modern science is a roaring farce. It is nothing more, to say the most of it, than individual experience, and ranks with such knowledge as that corns on one's toes are disagreeable and that wintry blasts are apt to be cold. Phenomena and their mere observation are not, as a rule, very illuminating. They need some explanation, some generalization, possibly even some theory or hypothesis to raise them to the dignity of scientific facts. When the Church of Rome forced Galileo to make his famous retraction in regard to the movements of the heavenly bodies, it based its authority upon simple observation and ecclesiastical dogma. It knew nothing of, and even denied, the generalizations and hypotheses that Galileo had worked out. It was satisfied that the earth stood still and all other bodies revolved around it, because such was the testimony of every man of common sense who had eyes to see. The inevitable soon occurred. The Church was shown to be puerile in its thinking, Galileo scientific. Tycho Brahe's long records in regard to the positions of the celestial spheres did not elevate astronomy to the plane of a science; only the generalizing of Kepler, from those long and laborious observations did that. Mil-

lions of people have watched apples fall. It was Sir Isaac Newton's enunciation of the hypothetical law of gravitation, however, that raised the phenomenon and its observation to a position of scientific interest. Mediæval alchemy was the poor culmination of the mere observation of certain phenomena. The science of chemistry was born when Dalton and others developed the atomic theory and related explanatory hypotheses.

There are medical men to-day who publish long and detailed reports of cases which they have observed. There are pathologists who describe and depict most elaborately what they behold under the microscope. There are physiologists who construct most ingenious apparatuses for recording curious graphic tracings. There are psychiatrists who cover reams of paper with mere repetitions descriptive of the actions of asylum inmates. The labors of every one of these men have, of course, a certain value. An infant's observation of the moon has also value. The worth of both sets of observations falls short of being scientific, until they are properly correlated and in some way explained. For the scientific elucidation of phenomena the inductive method of Bacon, when employed alone, is as faulty as the deductive method of Aristotle. Isolated and unexplained data stand for mere phenomena. Phenomena as such represent mere sensory reaction on the part of the observer. The observation is the only thing about them that can be truthfully denominated a fact. Observation *per se* is always liable to error by reason of the observer's personal equation and sensory instability. Such error can only be eliminated by the correlation of observations, by their rigid comparison and contrast, and this involves and results in the employment of imagination, reason, and judgment.

Facts, even most so called scientific facts, are not entirely beyond the charge of being mere descrip-

tions of our sense organs. The word fact, so revered by the great untrained mind of man, is not synonymous with truth. It means when so used by this great untrained mind of man merely sense observation or phenomenon. It becomes synonymous with truth only when it stands for some correlated phenomenon, some principle, some law discovered amongst a mass of sense observations. Redness is a fact to common sense, but it is not a truth. The same is to be said of sound. The truth in both instances is a particular form of movement, vibration. All knowledge is more or less relative, and a commonly called fact is the most relative thing of all. This is the reason why the advance of human knowledge has been borne along on "facts" that have almost invariably been found later on to be in need of different interpretation. The newer interpretations have arisen out of the discovery of the causes and underlying principles. The latter and not the so called facts then established the science.

This confounding real knowledge with the mere observation of phenomena explains many curious things in the history of science. It renders intelligible, for instance, the fact that science had its origin in ancient mythology. It accounts for its long struggle through mediæval witchcraft, necromancy, and astrology. It affords a *raison d'être* for the modern camp following of science, consisting of the half informed, semireligious, queer folk.

The origin of life in the sea, typified in the ocean born Venus; the panorama of the dawn so poetically sung in the story of Orpheus and Eurydice; the growing and moaning of the forests, attributed to the Dryads; the unceasing flowing of the brooks, urged on by the sportive nymphs; the wanderings of the moon among the stars as Diana chasing the deer; and the intense brilliancy and creativeness of the sun, depicted under the form of the glorious

Apollo, are not more fantastic than are some of the half superstitious, supernatural explanations offered nowadays for phenomena which, easily observed, are yet mysterious and unaccountable. Clairvoyancy, dream revelations, telepathy, spiritualism, Eddyism, and all the rest of the innumerable and rank growing brood that have lately sprung up and that are bound to recur in the future, represent in their last analysis the same mode of thinking which the ancient but more poetical mythology represents. The effect of the unscientifically trained mind to solve the riddle of nature and to explain and correlate appearances is the same everywhere and at all times. There is never any disagreement as to the appearances, and hence they are called facts and are identified with truth. The disagreement always originates in the attempt to explain these appearances; but here the personal equation, the power of intellect, enters, and the distinction between the trained and the untrained mind, between real science and pseudoscience, is vividly emphasized.

The man of imagination, with the visualizing and idealizing power developed as highly as the reasoning power, is needed in science, for he looks behind phenomena and reasons logically upon the hidden forces and principles. If the idealizing capacity outruns the logical, such a man becomes a mere dreamer, a dogmatist who assumes that the deductions formed out of whole cloth, as it were, by his imagination, constitute the final proof. He is nothing to science but an indolent, tawdry theorizer. If, on the other hand, he is idealist enough to imagine some law, principle, theory, or hypothesis lurking behind phenomena, and if he guards his hypothesis, both before and after its promulgation, by sound, logical deduction, reason, and verification, he rises to the position of a real scientist, such as Newton, Dalton, and Laplace were. His studies eventuate in real knowledge and his work becomes genuinely scientific.

We thus see that there is not only room for but actual need of the idealist in science, much popular opinion to the contrary notwithstanding. Indeed, I will go a step further and assert, in opposition to popular opinion, adroitly fostered by certain narrow minded, drudgelike investigators, that the genuinely scientific mind exercises its imaginative faculty quite as much as the genuine poet does, or quite as much as it does its own reasoning faculty. In his *Conversations on Some of the Old Poets* Lowell urges the rationalism of poetry, saying that "poets are vulgarly considered deficient in the reasoning faculty, whereas none was ever a great poet without having it in excess, and after a century or two men become convinced of it." Did not the poet Goethe offer the first suggestion out of which arose the greatest of the biological sciences, morphology? Was it not intimated clearly in Dante's *Inferno,* before Newton was born, that there is a law of gravitation drawing all things toward the centre of the earth? Is not Shakespeare really a greater and more subtle souled psychologist than John Stuart Mill or Herbert Spencer? Science demands of its devotees the same creative faculty that the poet possesses. Allow me to quote here what I have written elsewhere in an essay upon the *Poetry of Science:*

When Wordsworth glances into the face of a little child and from its happy smile gathers intimations of immortality, his play of imagination is not greater than is that of Dalton when he ponders upon the subtle phenomena of chemistry and perceives indications of a vast hidden world of atoms. When Burns beholds the tyranny of man in the fall of a Mountain Daisy, he is not far from Darwin, who discovers in the variation of species the cruel law of the survival of the fittest. When Mrs. Browning reads in the Dead Rose the lesson of the constancy of love, she differs not much from Sir Humphrey Davy when he melts two pieces of ice by rubbing them together and therein detects the great principle of the conservation of energy. When Schiller hears in the Song of the Bell the mutability of all things human, his train of thought is not unlike that of Huyghens when he gazes at a ray of light and beholds it

transmuted into a thousand ever varying undulations. Coleridge once stood at sunrise in the vale of Chamouni and glancing up at Mont Blanc, exclaimed:

> O dread and silent mount, I gazed upon thee
> Till thou, still present to the bodily sense,
> Didst vanish from my thought; entranced in prayer
> I worshipped the Invisible alone.

Darwin also stood face to face with Nature and witnessing the evolution of her thousand forms, reverently exclaimed: "There is grandeur in this view of life with its several powers having been originally breathed by the Creator into a few forms or into one; and that while this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been and are being evolved."

Stopford Brooke tells us that Farraday "was always in the temper of the poet, and, like the poet, continuously reached that point of emotion which produces poetic creation." As Byron, himself a poet, frankly acknowledges:

> "There are things whose strong reality
> Outshines our fairyland; in shape and hues
> More beautiful than our fantastic sky,
> And the strange constellations which the Muse
> O'er her wild universe is skillful to diffuse."

Or, as Rhys puts it when speaking of the student's chamber:

> "Strange things pass nightly in this little room,
> All dreary as it looks by light of day;
> Enchantment reigns here when at evening play
> Red firelight glimpses through the pallid gloom."

What poem has ever drawn upon the imagination or glowed with more fanciful idealization than the theories first put forth by Copernicus, La Place, Dalton, Buffon, Cuvier, Linnæus, Darwin, Lyell, Newton, Davy, Farraday, Thompson, Crookes, Virchow, Bichat, and Waldeyer? Indeed, the writings of these supreme dreamers of science read more like poetic inspirations than does half the versification which is sometimes denominated English poetry.

In the light of all this, a moment's reflection will show how little that deserves to be called scientific is really found in the elaborate reports from some of our laboratories, clinics, and post mortem examination rooms. By way of contrast let me say that I know a pathologist to-day who, tireless in his observations and the massing up of data, fondly imagines that thereby he is making a great name for himself in science. As a matter of fact, he is only a useful drudge. He has added absolutely nothing to the sum total of scientific knowledge. He has merely repeated the observations of others. His accumulation of data is about as valuable as the observations of the starlit firmament by ordinary men are valuable to astronomy. Some future pathologist may use these data to uncover some great law of cause and effect. Until then these disjointed and unrelated observations remain valueless as matters of real and useful knowledge. Ah! no, science is not observation, for then everything and every man would be scientific. Science is comprehension, correlation, systematization, something far more than the mere accumulation of statistics. Science is knowledge. As Stanislaus says, "Science, when well digested, is nothing but good sense and reason." Mere observation and the accumulation of statistics do not make very elaborate calls upon either good sense or reason. Oliver Wendell Holmes gently satirizes these mere observing, statistical men when he says, "Science is a first rate piece of furniture for a man's upper chamber, if he has common sense on the ground floor. But if a man hasn't got plenty of good common sense, the more science he has, the worse for his patient." As Stern intimates, this form of learning, namely, statistical observation, is the dictionary, whereas sense is the grammar of science. Anybody with drudgelike persistency can compile a dictionary, but to create or evolve a grammar calls for a rare and superior type of intellect.

This type of intellect is not more common in the medical profession than it is in any other class of men. Here, however, we witness much passing under the name of science that is nothing but multiplication of the simplest sort of observation. Long case reports full of insignificant detail and repetition, minute pathological descriptions, curious physiological experiments, and elaborate rehearsals of well known clinical phenomena are doubtless of some value, even as a child's description of an elephant, that it may have seen in one of its straying spells from home, is of value; but unless some explanation or correlation is vouchsafed at the same time, some hypothetical yet well deduced law affirmed for future approval or disapproval, the value is small. An eminent pathologist showed me some years ago a brain which he had just received, and which he said was histologically a most extraordinary specimen. His tone of dejection I shall never forget when he further said that the specimen was all but practically worthless for scientific purposes because the clinician who had sent it to him had not attempted to study the case in all of its symptomatic relationships. The clinical report could not be correlated with the pathological findings, and hence, though much time had been expended in mere observation in both, no real scientific knowledge was forthcoming. The lament of Thoreau voiced itself thus: "I should say that the most prominent scientific men of our country, and perhaps of this age, are either serving the arts and not pure science, or are performing faithful but quite subordinate labors in particular departments."

We are living in the age of science. Future historians will devote a chapter to it, as they do now to the Greek age of art, the Roman age of law and order, the ages of feudalism and of chivalry, of the Renaissance and reformation, of discovery and political revolution. This age—and what a glorious age it is to live in!—is treading close upon the foot-

steps of the Creator. It is learning the secrets of His handiwork. It is discovering the forces that He has employed in sending the planets on their courses through boundless space, in fixing the rocks and oceans and streams in their appointed places, in developing life through all its myriad forms up to that divine culmination, the human intellect. Wonderful are the revelations that daily open up before us. We marvel at our old ignorances and superstitions. We await in awe the newer light yet to be shed upon us. So rapid and startling are these scientific revelations and so wizardlike are their practical applications for our personal comfort, that, like little children upon a Christmas morning, we are excited, confused, and all but paralyzed with ecstasy. Some of us have utterly lost our heads and grown irreverent and egotistical. Others among us seem to crouch with fear and fly to newer and more ridiculous forms of superstition. Nearly all of us have become prone to laugh at authority and to stand with hands folded, obstinate and expectant, if not actually sceptical.

This is a transition age we live in. We have left darkness behind us, with yet many hidden mysteries in front of us. Now, if ever, do we need clear brains and reverent spirits. In an age like this men are wont always to go to extremes. Stunned by the magnitude of its discoveries, they seek relief in petty detail or prattle flippantly about that which is still unknown. Why do we not find the greatest thinkers of the world of art and literature among us today? Because of our engrossment in the petty details of research. Indeed, this age has been facetiously called "the age of the little"—the little story, the little piece of music, the little genre painting, the little bacteria. While this is not strictly true, it is true that there is much overemphasis of the little at the present time. Our apparent bigness, as instanced in our railroads, office buildings, financial transactions, and commercial corporations, is largely a matter of

mere reduplication. Hence one feels at times like Berlioz, I think it was, who, after leaving one of Chopin's most exquisitely soft and delicate piano recitals, shouted so loudly upon the street that one of his companions asked him if the music had, indeed, made him crazy. "No," he replied, "I am not crazy, but I have been listening to so much pianissimo that now I want a little fortissimo!"

This tendency to excess of detail, with bigness consisting of mere reduplication, leads, in this age, to the dangerous magnification of means with corresponding blindness to the end. As a recent writer in the *Atlantic Monthly* pointed out, the dominant fault of the average man is the hopeless losing of himself in the means. He allows himself to become immeshed in it like a fly in a spider's web. As the writer shows, this is preeminently noticeable in the financial and commercial worlds. Money making has become the end here, though every child knows that money is absolutely useless except for what it brings or as a means to an end. Many are to-day entranced with machinery, telescopes, microscopes, automobiles, and the other means whereby we are striving to climb to knowledge and happiness. As this entanglement in the means results in the money world in greed, strife, discontent, irreverence, and even criminality, so in the world of intellectual activity it leads to out and out chicanery and scientific hypocrisy. That which is not knowledge is fatuously or fraudulently palmed off as knowledge. Truly Emerson says, "when a naturalist has got all snakes and lizards in his phials, science has done for him also and has put the man into a bottle." When thus engulfed in the little and lost in admiration of the means, a man is not unlike Socrates when he proclaimed that he could never learn anything from the fields and trees, or like Samuel Johnson when he announced that, "having seen one green field, you had seen them all." If ever an age were in need of well

balanced idealists, men of broad liberal minds, men who can distinguish mere agency from finality, it is this age. Very recently I read a long and exhaustive article, published in two installments, full of petty details of description and illustration, at the conclusion of which the distinguished authors stated that what they had been trying to demonstrate was still a matter of complete uncertainty. All that paper and ink for that vapid conclusion! It doubtless looked and sounded very scientific. An investigator, however, less entranced with mere agencies, would have saved his readers' time and eyesight by stating that he had no information to give upon the subject in question. Let it be repeated, *science is knowledge,* not mere statistical accumulations. The greatness of Goethe's Faust lies partly in the fact that it represents a protest against the belittling, detailed science which is devoid of idealism and intellectual breadth. The present age is beginning to weary of scientific coxcombs, men who arrogate to themselves the name of scientists but who never add a single grain to the sum total of human knowledge. It wants men who can *interpret* and *explain,* not merely observe, the phenomena of the world about us. It has small rewards for the mere compilers of the commonplace, the laborious collectors of dry statistical husks and irrelevant accumulations.

In conclusion, then, let it be clearly recognized that there is an *art* and there is a *science* of medicine. Those who practise medicine as a fine art and as a real science are far from being numerous. In fact, they constitute quite a minority in the profession. There is still abundance of room for him who sincerely desires to develop this noble art and wonderful science. What Lincoln said about fooling all the people all the time is as true here as elsewhere, depend upon it. An honest and earnest effort to attain that which is the best, the highest, and the truest, even in medicine, never goes long unrecog-

nized and unrewarded. I would merely add as my final word to you, young men, that you be true to yourselves and to your divine privilege of manhood. Live up to the full stature of your endowments and make for the advancement of your chosen profession along the lines of true art and science, as I have endeavored, all too briefly, to indicate them to you.

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